Head of Wolf Creek (1063)

Head of Wolf Creek Spring (Figures 7a & 7b) in northwest Meade County [N38°-03′-58″; W86°-21′-34″], is a 12 m-wide (40 ft) bluehole spring, partially encircled by a low limestone bluff and gravel road.

Figure 7a: Head of Wolf Creek

Head of Wolf Creek Spring is mapped with a spring symbol on the west-central portion of the New Amsterdam Quadrangle and is the head of perennial flow in Wolf Creek. It discharges from the Ste. Genevieve Limestone (Amos, 1972), at 123 m (402 ft) elevation, in ruggedly dissected terrain. This is the only spring mapped on the Kentucky portion of the New Amsterdam 7.5 minute Topographic Quadrangle (two map locations are named Cold Springs and Mints Springs but spring symbols are not shown; Cold Springs, which is renamed Lodale on GQ-990, is a minor sinking spring perched near the base of the Beech Creek Limestone Member). Head of Wolf Creek Spring is a seasonal overflow spring that commonly discharges 300-600 L/s (10-20 ft^3/s) during winter but reduces to about 15 L/s (0.5 ft^3/s) of local drainage during low flow. The spring drains a sizable basin based on positive dye traces conducted by Groundwater Branch personnel from 10 km to the southeast.

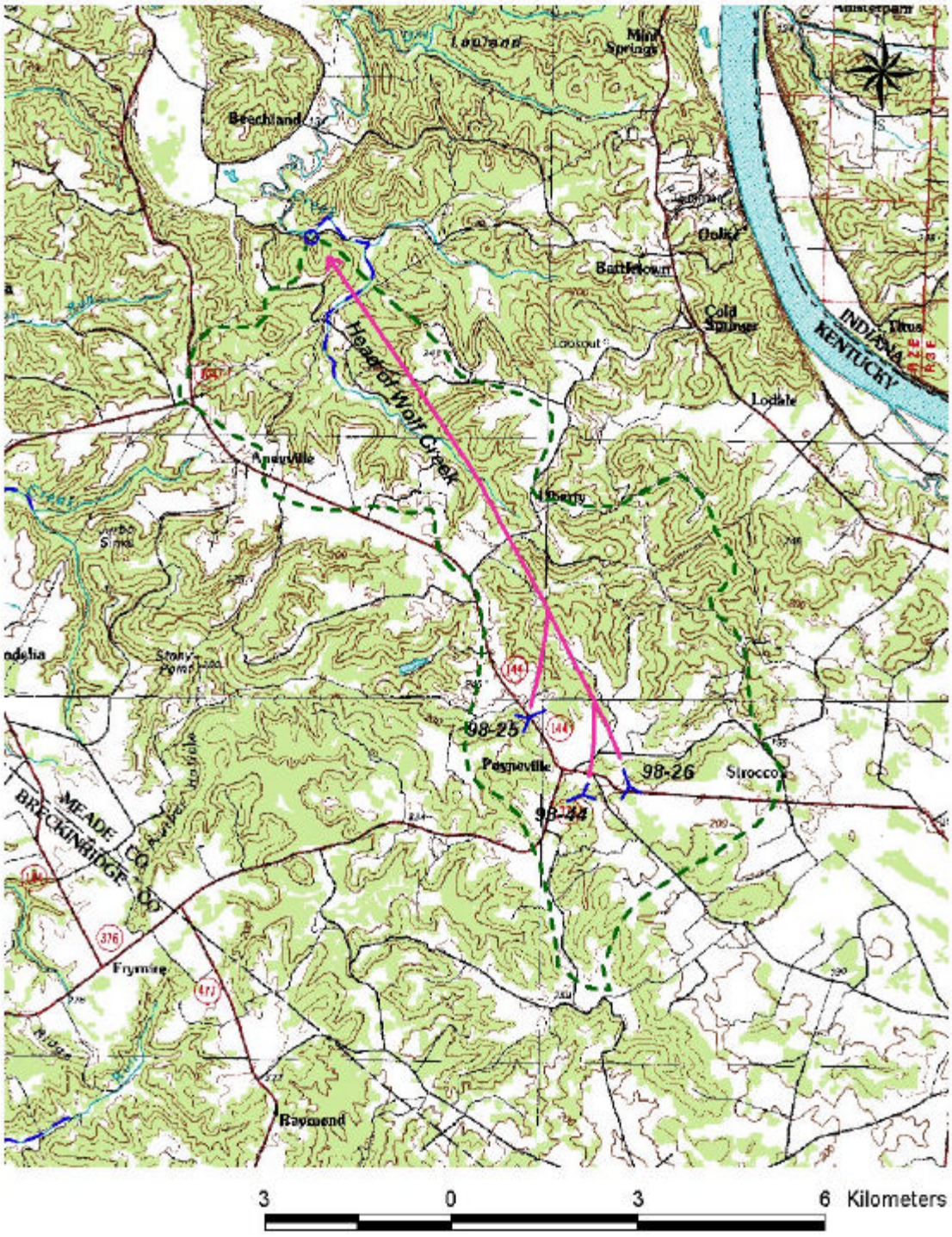

Figure 7b: Head of Wolf Creek Spring Basin:
Low-Flow Discharge 14 L/s (0.5 ft^3/s); Basin Area 42.5 km^2 (16.4 mi^2); UBF 0.33 $L/s/km^2$ (0.03 $ft^3/s/mi^2$); Land-use 27.9% Agricultural, 70.1% Forest

Dye tests of Head of Wolf Creek:

98-25

April 22, 1998: 0.45 L (0.12 gal) of Rhodamine WT was injected in at **Payneville Culvert**, a losing seep. Fourteen days later, a trace of dye was detected at Head of Wolf Creek (?), 8.5 km (5.25 mi) to the north-northwest, and within 36 days dye was positive at Wolf Creek (+). Four other sites were negative during this trace.

98-26

April 22, 1998: 280 g (10 oz) fluorescein was injected at **Mathews Swallet**, a sinking spring. Fourteen days later, Head of Wolf Creek (+), 10 km (6.25 mi) to the north-northwest, was positive, whereas four other sites were negative. The spring was positive for eight weeks.

98-44

September 28, 1998: One Liter (0.25 gal) of Rhodamine WT was injected into a sinking stream at **Vessels Spring**. Because of dry weather, the dye was locally retained in a stagnant zone for more than two months and was not recovered. Dye monitoring was discontinued between October 8 and December. When monitoring was continued on December 9, the dye was recovered in Head of Wolf Creek on four receptor exchanges until January 6, 1999. None of the dyes injected into the Head of Wolf Creek basin, near Payneville, were recovered in the Payneville Elementary School water-supply well.

Southwest Study Area

Barkers Mill (0959)

Barkers Mill Spring (Figures 8a & 8b) in southeast Christian County [N36°-40′-38.2″; W87°-21′-17.7″] is a 9-12 m (30-40 ft)-wide bluehole spring that develops a 60 m (200 ft)-long spring run to West Fork.

Barkers Mill Spring discharges at about 132 m (432 ft) elevation near the top of the St. Louis Limestone (Klemic, 1966) and is used for a local domestic water supply. The spring exposes a low limestone ledge at the north edge of the bluehole, but the tree-lined, 6 m (20 ft)-wide spring-channel is formed in alluvium. Two minor karst windows are located just northwest of the bluehole. This is the largest known Kentucky spring west of Logan County and 18th largest in the state, but it is not mapped on the Trenton 7.5 minute Topographic Quadrangle nor the corresponding Geologic Quadrangle (Hammacksville). This spring was first mapped in 1988 during karst hydrologic studies of the Campbell Army Airfield, at Fort Campbell, Kentucky (Carey, 1990). The average low flow from three measurements is 170 L/s (6.0 ft^3/s), but drought flow (12-9-99) was about 40% less at 102 L/s (3.6 ft^3/s).

Figure 8a: Barkers Mill Spring

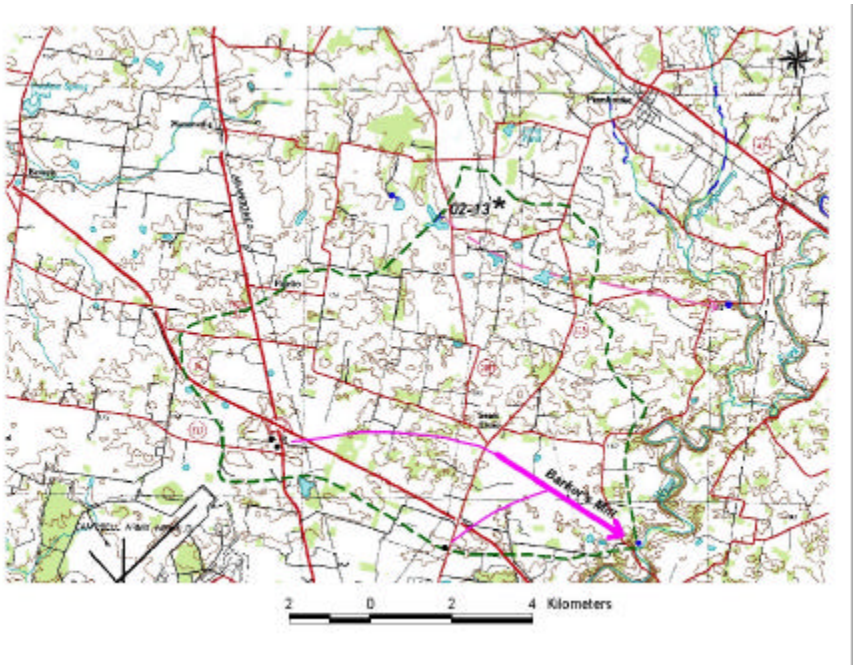

Figure 8b: Barkers Mill Spring Basin:
Low-Flow Discharge 170.0 L/s (6.0 ft^3/s); Basin Area 69.2 km^2 (26.7 mi^2);
UBF 2.4 $L/s/km^2$ (0.22 $ft^3/s/mi^2$); Land-use 93.0% Agricultural, 3.0% Forest
(*02-13: Recent dye trace from seasonal lake to Fredericks Spring)

Dye tests of Barkers Mill Spring by Ewers Water Consultants

River Bend (0860)

River Bend Spring (Figures 9a & 9b) in E Trigg County [N36°-48′-35″; W87°-44′-53″] is a rising spring that emerges from beneath a low limestone ledge at the head of a 3-5 m (10-15 ft)-wide, 30 m (100 ft)-long, doglegged spring run to Little River.

Figure 9a: River Bend Spring

River Bend Spring discharges at about 116 m (380 ft) elevation near the base of the Ste. Genevieve Limestone (Ulrich and Klemic, 1966). The 3 m (10 ft)-deep spring channel is formed in Little River alluvium. River Bend Spring is not shown on the Caledonia 7.5 minute Topographic Quadrangle, although a minor perched spring is mapped about 518 m (1700 ft) to the south. River Bend Spring is the 19th largest in the state and was first inventoried during this study.

The presence of a major regional underflow spring was initially hypothesized in this area due to the occurrence of large seasonal overflow springs on Boyd Lake Branch five km (three mi) to the east-northeast. River Bend Spring is located within 215 m (700 ft) of a mapped fault that may have influenced conduit and spring development at this point. The average low flow from three measurements is about 159 L/s (5.6 ft^3/s), but drought flow (12-8-99) was about 48% less at 82 L/s (2.9 ft^3/s).

Figure 9b: River Bend Spring Basin:
Low-Flow Discharge 158.6 L/s (5.6 ft^3/s); Basin Area 70.0 km^2 (27.0 mi^2); UBF 2.3 L/s/km^2 (0.21 $ft^3/s/mi^2$); Land-use 87.7% Agricultural, 4.7% Forest (+4% Woody Wetlands)
(NOTE: The landowner does not permit driving across fields to gain access to this spring.)

Dye Tests of River Bend Spring:

98-08

March 17, 1998: 1.5 L (0.4 gal) of Rhodamine WT was injected at **Walker Swallet,** about 1.5 km (1 mi) to the northwest of McGaughey Swamp. Nine days later River Bend Spring (++), 8.5 km (5.25 mi) to the west-northwest, was very positive while 11 other sites were negative. River Bend Spring was positive on two additional dye-receptor exchanges over 20 days.

98-59

December 16, 1998: 310 g (11 oz) SRB was injected at **Moore Swallet**, 1.0 km (0.6 mi) east of Boyd Lake Branch. The flow condition was not ideal, and some dye was lost to adsorption on sediment and organics due to inefficient inflow. Six days later, an inconclusive dye recovery was made at Caledonia Bluehole (?), an overflow spring 9 km (5.5 mi) to the west. Thirty-eight days after injection, Caledonia Bluehole (+) was positive, as well as nearby Cane Overflow (+), while River Bend Spring (?) was inconclusive.

River Bend Spring was hypothesized to be the primary underflow spring related to the group of four overflow springs in the Caledonia area. The 98-59 trace failed because an insufficient amount of dye was used. Therefore, in order to adequately test this important hypothesis, Moore Swallet was re-tested by injection 99-25, described below.

99-25

April 29, 1999: 280 g (10 oz) fluorescein was re-injected at **Moore Swallet**, which was visited several times before an acceptable flow condition was obtained. During this second dye injection, 6 L/s (0.2 ft^3/s) of stream-flow was actively running underground at a swallet that accepted all of the flow. The hypothesis was confirmed seven days later when River Bend Spring (+), 13 km (8 mi) to the west, was positive, while three additional sites were negative. In addition to Cane Overflow, which was previously positive, four other overflow springs in the Caledonia area were all positive (Because of their proximity, Caledonia East BH and USGS "Spring" are consolidated as one overflow-spring symbol). Recovery of subsequent dye receptors indicated that all of the tracer dye had exited the flow system within seven days. These data confirm a groundwater flow rate in excess of 1.9 km/day (1.1 mi/day) through a very efficient conduit.

Cook (1141)

Cook Spring (Figures 10a & 10b) in north Trigg County [N36°-55′-27″; W87°-48′-41″] is a 12 m (40 ft)-wide bluehole spring, adjacent to a low limestone ledge, that develops a 180 m (600 ft)-long spring run to Muddy Fork of Little River.

Figure 10a: Cook Spring

The steep alluvial channel banks of the spring are about 3 m (10 ft) high. Cook Spring discharges at about 113 m (370 ft) elevation from the Upper Member of the St. Louis Limestone (Seeland, 1968). It is not mapped on the Cobb 7.5 minute Topographic Quadrangle nor the geologic quadrangle. No related overflow springs are known. Cook Spring was originally inventoried during a regional hydrologic investigation of a gasoline spill near Gracy, Kentucky, in 1986. As suggested by Crawford and Mylroie (unpublished manuscript), the main trunk flow route of the Cook Spring basin is probably structurally controlled by east-west normal faults. The average low flow from three measurements is about 93 L/s (3.3 ft^3/s).

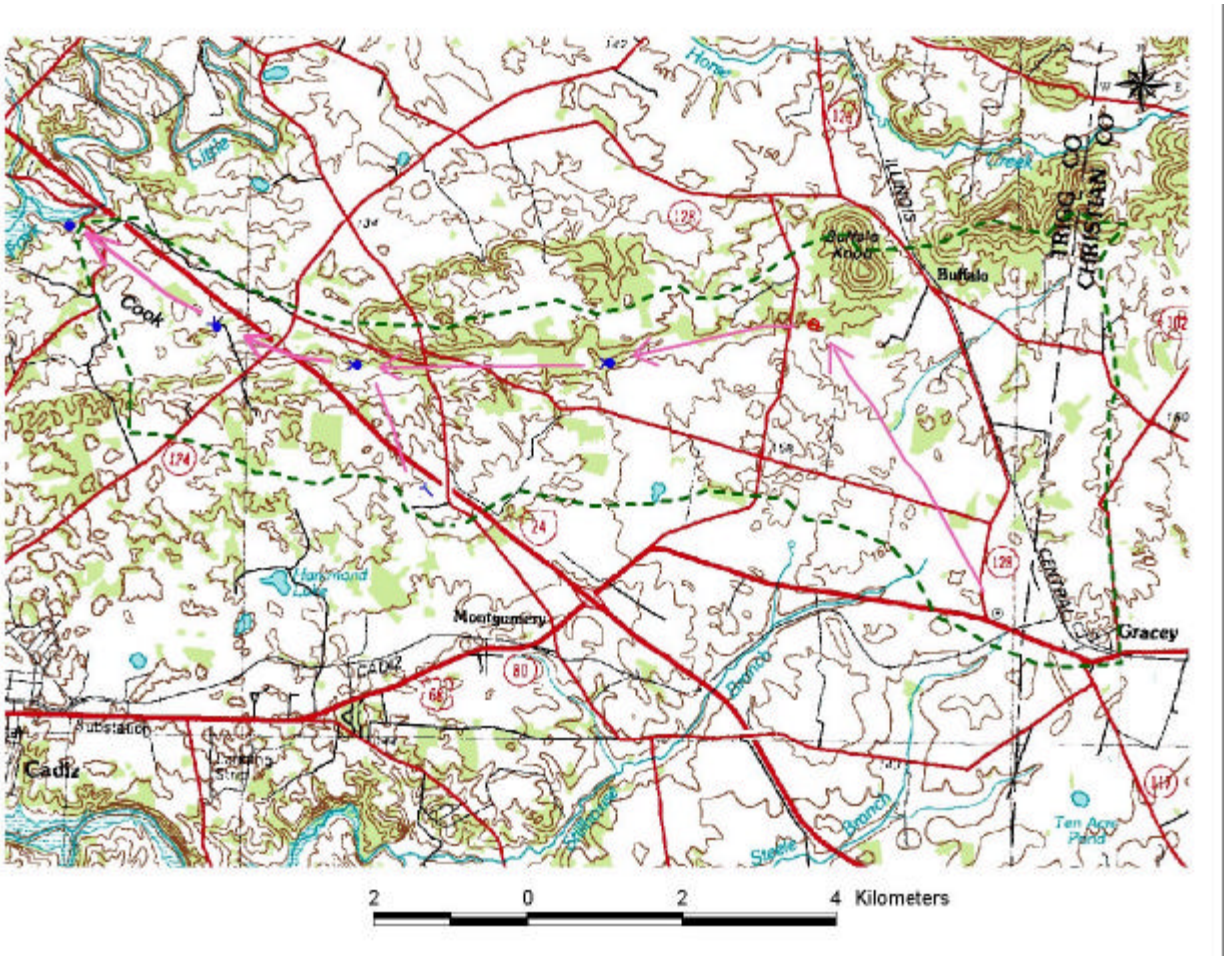

Figure 10b: Cook Spring Basin:
Low-Flow Discharge 93.5 L/s (3.3 ft^3/s); Basin Area 41.7 km^2 (16.1 mi^2);
UBF 2.2 L/s/km^2 (0.20 $ft^3/s/mi^2$); Land use 75.3% Agricultural, 17.1% Forest

Dye tests of Cook Spring (Crawford, 1989 and Ewers, 2001)